Date: Tue, 10 Aug 93 04:30:19 PDT
From: Ham-Homebrew Mailing List and Newsgroup <ham-homebrew@ucsd.edu>
Errors-To: Ham-Homebrew-Errors@UCSD.Edu
Reply-To: Ham-Homebrew@UCSD.Edu
Precedence: Bulk
Subject: Ham-Homebrew Digest V93 #6
To: Ham-Homebrew

Ham-Homebrew Digest Tue, 10 Aug 93 Volume 93 : Issue 6

Today's Topics:

Send Replies or notes for publication to: <Ham-Homebrew@UCSD.Edu>
Send subscription requests to: <Ham-Homebrew-REQUEST@UCSD.Edu>
Problems you can't solve otherwise to brian@ucsd.edu.

Archives of past issues of the Ham-Homebrew Digest are available
(by FTP only) from UCSD.Edu in directory "mailarchives/ham-homebrew".

Date: 9 Aug 1993 10:42 CDT
From: usc!elroy.jpl.nasa.gov!swrinde!menudo.uh.edu!jane.uh.edu!
inde8fh@network.ucsd.edu
Subject: AM/FM Antennas using tv antenna- help needed
To: ham-homebrew@ucsd.edu

I wanted to make an antenna using tv antenna (two of them -VHF and UHF) that I
have lying around. I have cable now so I am not using these antennas right now.
The idea is to get distant AM/ FM stations. Anybody got any suggestions? I
am using an ordinary portable stereo reciever -Panasonic's RX-CT840 right now.
If I really get hooked to dxing I might get a better receiver. Pls. post here
or send me a reply. I will try to accumulate all of them and post them here if
I get sufficient replies.
Don

AND GOD CREATED MAN

Date: 9 Aug 93 12:28:45 EDT
From: psinntp!arrl.org@uunet.uu.net
Subject: DSP receiver (was: Single frequency receiver)
To: ham-homebrew@ucsd.edu

In rec.radio.amateur.homebrew, alanb@sr.hp.com (Alan Bloom) writes:
>Zack Lau (zlau@arrl.org) wrote:
>
>: It might be interesting to do a DSP receiver with a TRF front end
>: when the technology gets cheap enough for your budget. It ought to be
>: possible to to an "intelligent" detector, one that can detect interference
>: on one sideband and switch to the other. The band limited signal
>: provided by the front end greatly eases the requirements of the A/D
>: converter ...
>
>There are two main challenges with the idea. One is dynamic range.
>A 16-bit A/D only gets you about 96 dB. That would be plenty for an
>IF filter: Most out-of-channel strong signals would have been pre-
>filtered out with a crystal filter and an AGC system could keep the
>desired signal well within the dynamic range of the A/D. But in a
>TRF receiver, the A/D must simultaneously handle the desired weak signal
>and all the unwanted strong signals within the preselector passband.

Exactly. And in order to achieve the theoretical dynamic range of
any A/D, the analog circuitry "up front" in the A/D must exhibit
dynamic range sufficient to the task. That is, a theoretical 20-bit
A/D with 120-dB dynamic range requires that its analog circuitry
cope with a 120+ dB range of input signals. The idea that using
DSP in a receiver eliminates the requirement for high-dynamic-range
analog circuitry just ain't so. (As an example, the Analog Devices
AD776, a 16-bit sigma-delta A/D, specs third-order IMD at -98 dB,
which is slightly better than the 96-dB range of 16-bit quantization.)

[appropriate example deleted]

>The other problem is sample rate. If you use the DSP at a fixed
>IF frequency, you can undersample at a rate determined by the IF
>bandwidth, not the IF center frequency. A sample rate on the order
>of 50 kHz or so would sufice for most communications receivers.
>In a TRF receiver, the simplest method would be to sample at greater
>than Nyquist rate (i.e. more than twice the highest RF frequency.)
>You theoretically could use the undersampling trick, but you would
>have to change the sample rate when the RF frequency is tuned to
>avoid aliasing problems.

If you sampled based on the IF bandwidth, yes, but another option
would be to sample at a rate that encompasses the tuning range of

the receiver. Wide front-end filters would act as the anti-aliasing filters. Of course, this scheme exacerbates the dynamic-range problem, but what do you want, egg in your beer?

>Even if you undersample, the sample-and-hold circuit must be specified
>at the RF/IF frequency, not at the sample rate. With a superhet, you
>can use a fairly low last IF frequency, greatly easing the S/H specs.
>A 60+ MHz S/H with 16-bit accuracy is not a low-cost off-the-shelf item!
>And as I showed above, 16 bits would give marginal dynamic range.

You bet. And the more bits you use, the more stringent the requirements on the S/H. The key characteristic is the *aperture* time, which can be loosely defined as the period of uncertainty in the sampling process. Even moderately small (12- to 16-bit) A/Ds impose very short aperture time requirements. For example, a 16-bit A/D sampling at 200 ksps allows an aperture time of only about 25 nsec. That requires some pretty fast (wide bandwidth) analog circuitry!

>Not to discourage anyone from trying out new ideas. But, be aware
>it would not be a trivial project!

Yep. What the sample-at-operating-frequency HF ham receiver needs is a 20-bit (more would be better) sampling A/D (with intermod performance to match) that can operate at, say, 60 Msps. Oh, and cost less than $100. I've yet to see one. Until I do, I'll continue to promote the idea of sampling at a reasonable (low) IF.

By the way, this stuff isn't just theory. Sampling at IF is what W-J's DSP-based receiver does. I've played with IF sampling, too, undersampling the 100-kHz IF output of my TS-930S with an 8-bit A/D (the same one used in the W9GR box, actually) and processing the samples with a TMS320C25 operating at a 32-MHz clock rate. [For those who are interested, I'm sampling at about 30 kHz, more precisely at (100/3.25) kHz, which places the 100-kHz IF center frequency in the middle of the 92.3- to 107.7-kHz (3-3.5 Fs) aliased sampling range. Of course, I'm not sure how well the 6-kHz AM filter attenuates signals at a bandwidth greater than 15 kHz, but I'm just playing around anyway, so I don't care if a little unwanted slop aliases into the system.]

I implemented the classic SSB phasing-type demodulator on this system. When I get some time (hah!) I plan to finish the job by providing phase locking of the "BFO" (within the DSP, you understand) to the AM carrier for AM synchronous detection. The point is that the radio's superhet circuitry, including the AGC, allows use of an 8-bit A/D.

For the time being, at least, down conversion to a low IF is still the best approach for a DSP-based ham receiver. Systems that don't impose

the high-dynamic-range requirements hams have may be able to use DSP
directly at operating frequency; we can't--yet.

Jon Bloom, KE3Z | jbloom@arrl.org
American Radio Relay League |
225 Main St., Newington CT 06111 |

Date: 9 Aug 1993 08:50:11 -0400
From: dog.ee.lbl.gov!overload.lbl.gov!agate!spool.mu.edu!darwin.sura.net!udel!
news.intercon.com!panix!not-for-mail@network.ucsd.edu
Subject: phone wiring
To: ham-homebrew@ucsd.edu

In <1993Aug9.005059.6217@mksol.dseg.ti.com> blair@mksol.dseg.ti.com (arthur blair)
writes:

>Any one out there familiar with phone circuits? I've got several
>"extension" cables for phone jack to whatever (modem, phone, etc):
>flat grey cable, little plastic RJ connector with spring clip,
>4 conductors (black, red, green, and yellow). I think they are
>called modular cables.

>On all but one cable the wires are reversed (b-r-g-y on one end,
r
>y-g-r-b on the other). But the one I'm using now to connect my
>modem to the phone jack doesn't have the 4 wires reversed. It's
>the longest cable I have, thats why I'm using it. Is this cable
>right, or did Radio Shack screw up? It works ok unless I pick
>up the phone that's connected to my modem. Neither modem nor
>phone likes that. They both get pretty upset.

Much of this answer is paraphrased from The Phone Book, ISBN 8-89043-364-X,
published by Consumer Reports, chapter 15.

Each pair of wires providing a dial tone has a distinct electrical
polarity. Generally the red wire is negative relative to the green
one, and the yellow one is negative relative to the black one.

If you spend a moment or two sketching out the interconnections
(imagine a cable, with a female-to-female adaptor at one end, serving
as an extension cord) you will agree that to maintain the polarity
it is necessary to swap red and green at the two ends of a modular
cable. Same for yellow and black.

Necessary in the sense that if the telephone instruments are polarity
sensitive, then failing to swap red and green would cause trouble for

the instruments. But these days few newly-manufactured products are polarity sensitive.

Your post contains what I suspect is the real answer -- the cable is "long". This leads to crosstalk between line 1 and line 2, which would reveal itself most often when, say, you pick up the voice line while in the middle of a data connection.

The best fix here is to stop running line 1 and line 2 in parallel for that length. Instead, use two separate cables. To effectuate that, you should either break the one two-line jack up into two jacks (one for line 1 and one for line 2) or use a two-line adaptor that provides each line individually from the two-line jack.

>I want to replace this cable with a shielded version. But I need to
>know if I should reverse the wires before crimping the connectors
>on. Also, do you strip the wires before inserting them into the
>connector? If so, how much? What should I ground the shield to?
>(the modem end or the jack end?). Or should I ground it at all?

There are several problems with what you are saying here. The first is that you will not be able to connect shielded cable to the modular plugs -- the plugs were designed specifically for flat satin flexible phone cable, with aluminized mylar conductors. The plugs (I assume you are talking about the crimp connectors) will not work with traditional stranded wire.

Yes, if you feel you must make your own modular cable, you should definitely swap red and green, and yellow and black. Most crimping tools for modular cables come with this instruction, as well as instructions that if you are using the correct type of cable (the satin finish flat cable) you strip off a standardized length of the outer jacket (using a calibrated stripper that is in the tool) but do not strip the colored wires inside.

If the cable you want to use, that has a shield, simply has a shield around both pairs, then you are still going to have your crosstalk. Indeed it may be worse with the shield confining the electromagnetic fields from the wires.

The way to avoid crosstalk between two phone lines is to select cable in which the red and green are twisted around each other, and as a separate matter the yellow and black are twisted around each other. Actually when you find wire that meets this twisting requirement you will generally find it does not have the red, green, yellow and black colors. Instead, pair one is blue and white striped, and pair two is orange and white striped.

Of course, such wire does not fit into modular plugs for crimping,

so to use it you would have to actually install new jacks, stapling
wires to baseboards and the like.

Yet another way to reduce crosstalk is to use a short cable instead of
a long one. But I assume you are using a long cable because you need
to ...

--
Carl Oppedahl AA2KW (patent lawyer)
1992 Commerce Street #309
Yorktown Heights, NY 10598-4412
voice 212-777-1330

Date: Mon, 9 Aug 1993 13:43:42 GMT
From: dog.ee.lbl.gov!overload.lbl.gov!agate!usenet.ins.cwru.edu!gatech!
fentem.gatech.edu!fentem@network.ucsd.edu
Subject: single frequency receiver
To: ham-homebrew@ucsd.edu

Thought I'd jump in here and describe one I built a few years ago. It was a
TRF receiver designed to pick up WSM (650 kHz) only. After trying several
receiver architectures, including mixing down to 455 kHz, I found the one
that worked best for me was simply cascaded stages of JFET amplifier
stages. Brute force, but clean and simple.

Between each stage was a double-tuned LC filter. The coils used here were
some 455 kHz transistor IF transformers obtained from Mouser, modified by
removing the internal capacitor. Their unloaded Q at 650 kHz measured
around 100.

I observed careful layout techniques and had absolutely no instability
problems. Tuning/alignment was smooth, and the JFETs were easy to work
with and control.

The input stage was configured with a pair of JFETs in a push-pull
arrangement. Transformer coupling provided a balanced input; the antenna
was a 2 foot tuned loop. This helped provide some relief from power line
noise.

The detector I ended up using was an absolute value amplifier circuit using
an OP-27 op amp. Easy to build, and works very well.

Since WSM transmits in AM stereo, I also tried a C-QUAM demodulator using
Motorola's MC13020. This circuit worked well with a strong signal, but I

found distortion to be a problem during multipath fading. So it was abandoned.

A second OP-27 op amp detector was used to develop AGC voltages for the JFETs. I used small trimpots to set the voltages for each stage.

I'd ordered a couple dozen JFETs, and measured each one's pinch-off voltage and IDSS. From these, I selected matched ones to use in the receiver.

I used modular construction throughout so I could try different circuits with minimum hassle. I learned a lot in the process and had a lot of fun doing it. And the final result was very rewarding.

$.02

-Dave, KW4M

+---+
David R. Fentem	david.fentem@gtri.gatech.edu
Georgia Tech Research Institute	CompuServe: 70674,3306
GTRI/ESML	Voice: (404) 894-7045
Atlanta, GA 30332-0800	FAX: (404) 894-7080
+---+

Date: Mon, 9 Aug 1993 14:40:32 GMT
From: dog.ee.lbl.gov!overload.lbl.gov!agate!spool.mu.edu!darwin.sura.net!news-feed-2.peachnet.edu!news-feed-1.peachnet.edu!gatech!fentem.gatech.edu!fentem@network.ucsd.edu
Subject: single frequency receiver
To: ham-homebrew@ucsd.edu

Oops - follow up to my previous post. I used an NE5539 op amp for the detector, not an OP-27.

(What I get for trying to rely on memory :)

-Dave, KW4M

+---+
David R. Fentem	david.fentem@gtri.gatech.edu
Georgia Tech Research Institute	CompuServe: 70674,3306
GTRI/ESML	Voice: (404) 894-7045
Atlanta, GA 30332-0800	FAX: (404) 894-7080
+---+

Date: 9 Aug 93 18:36:37 GMT
From: ogicse!psgrain!ee.und.ac.za!shrike.und.ac.za!pc-bdonal.ee.und.ac.za!
bdonal@network.ucsd.edu
Subject: Synth for 15 to 20 MHz
To: ham-homebrew@ucsd.edu

Hi,

I am in the process of designing a synthesiser for a rig that will cover the 2m and APT satellite bands. Since the receiver has a * by 8 stage, and a 10.7 MHz IF, what I require is a synthesiser capable of covering the the range from 15.66 to 18.16 MHz, in 1.25 KHz steps.

If anyone can point me in the direction of circuits for such a system, I would greatly appreciate it - there must be many people who have converted their 2M 'rock' sets to synth. Any pointers to synth IC's covering this range would also be great. With the cost of crystals at about $20 per set, the synth option seems the way to go, since I would ideally like to receive at least 15 channels.

By the way, I have read the section in the ARRL handbook on synth chips, and could no doubt design the synth that I need. What I really need is advice on the easiest, and cheapest, way of doing what I want.

Brian.

Email: bdonal@elaine.ee.und.ac.za
Fax: (27) 31-8162111

End of Ham-Homebrew Digest V93 #6
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